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EXECUTIVE SUMMARY

INTRODUCTION

The streets of our cities and towns play an important role in the livability of our communities. Everyone, regardless of age, ability, income, race, or ethnicity, should have safe and convenient access to community destinations and public places—whether walking, wheeling, driving, bicycling, or taking public transportation. Yet, too many of our streets are designed only for cars, and how quickly they can move up and down streets. They are unsafe for people on foot or bike—and unpleasant for everyone. Changes are needed to improve the efficiency and capacity of our streets to move people in the same amount of space without having to rely on their car. Many cities and towns now have plans and policies to ensure safety and convenience on streets throughout the community, not just for drivers, but for all users including pedestrians, bicyclists, and transit riders.

The principles of Complete Streets fits well within the overarching mobility goals and objectives of Orange County’s Creating Healthy Schools and Communities initiative. As an approach to design, Complete Streets aims to provide safe access to all modes of transportation for all ages and abilities. Increasingly it also means to encourage active transportation and green the streetscape to improve environmental conditions and benefits to public health.
WHAT IS A COMPLETE STREET?  

Simply put, “complete streets are streets for everyone.” This means that streets are safe, comfortable, and convenient for all users no matter their mobility level or preferred mode of travel. By planning, designing, operating, and maintaining Complete Streets, communities of all sizes - from small rural towns to large cities - can provide convenient and comfortable access and travel for all users regardless of their transportation mode. Complete Streets enable those walking, wheeling, bicycling, driving automobiles, riding public transportation, and delivering goods to share the road safely and allow communities to achieve greater economic, environmental, and public health benefits. Complete Streets go beyond just the street; if the underlying principles of universal design are adhered to and effectively executed, an inclusive and accessible environment for pedestrians and transit users will be achieved.
COMPLETE STREET POLICIES & LAWS

Implementation of complete street design principles is easier when supported by local, state, and county government laws and policies. On April 13, 2015, Port Jervis’ Complete Streets Resolution was the first of its kind passed in Orange County. This follows the Complete Streets Act signed by Governor Andrew Cuomo on August 15, 2011. This bill requires “state, county and local agencies to consider the convenience and mobility of all users when developing transportation projects that receive state and federal funding.” While lacking an official complete streets policy, the City of Newburgh has taken steps towards complete streets outside of this planning effort, including a demonstration project in June of 2016.
SAFETY
Designing the street with pedestrians in mind - improved lighting, sidewalks, raised medians, better bus stop placement, and traffic calming measures - has been shown to improve pedestrian, bicyclist, and motorist safety. Moreover, when more residents use active transportation there are more people in the public realm, and increased active transportation creates a safer setting for children as they travel.

ECONOMIC VITALITY
Communities that undergo complete streets improvements can bolster local business and spur economic development. Complete streets encourage private investment and businesses often look at the health of a community when deciding where to locate because of insurance costs. Making it easier for residents and visitors to walk, bike, or take transit to their destinations helps them to spend money locally. Instead of paying for the cost of owning a car, individuals can pay for housing, restaurants, and entertainment.

JOB GROWTH
Road improvement projects that include bike and pedestrian facilities create more jobs per dollar spent, compared to those that are only designed for vehicles. Moreover, cycling adds jobs to the economy through increased tourism, bicycle manufacturing, sales and repair, bike tours, and other activities.

HEALTH
Complete Streets encourage walking and bicycling and improve air quality, all important for our health (reduce obesity, asthma, and illness).

EQUITY
Complete Streets are equitable and help to provide access to daily activities, such as employment or school, among those who don’t have a car.

TRAFFIC CONGESTION
Complete Streets can help ease transportation woes and increase the overall capacity of the transportation network.
CREATING HEALTHY SCHOOLS AND COMMUNITIES

Creating Healthy Schools and Communities (CHSC) is a five-year (2015-2020) public health initiative to reduce major risk factors of obesity, diabetes, and other chronic diseases in 85 high-need school districts and associated communities statewide. The New York State Department of Health (NYSDOH) has funded local organizations and county health departments and Orange County was one of 26 grantees who were awarded funds as part of CHSC. The goal is to implement multi-component evidence-based policies, place-based strategies, and promising practices to increase demand for and access to healthy, affordable foods and opportunities for daily physical activity for all New Yorkers. The Obesity Prevention Center for Excellence (OPCE), led by JSI Research & Training Institute, Inc. (JSI) strengthens the CHSC Initiative’s collective impact by providing technical assistance, training, resources, and a network to collaborate.

CHSC STRATEGIES

- Revise, implement, and assess local wellness policies to improve the school environment.
- Establish Comprehensive School Physical Activity Programs (CSPAP).
- Increase access to healthy, affordable foods and increase school districts' ability to meet federal nutrition standards for foods sold outside of school meals.
- Restrict food marketing to children.
- Increase access to healthy, affordable foods in communities.
- Increase adoption and use of food standards and procurement policies that increase healthy foods in community sites and settings.
- Adopt and implement Complete Streets policies, plans, and practices to increase access to opportunities to walk, bike, and roll.
1 INITIATIVE

Creating Healthy Schools and Communities (CHSC) is a five-year (2015-2020) public health initiative to reduce major risk factors of obesity, diabetes, and other chronic diseases in 85 high-need school districts and associated communities statewide. The New York State Department of Health (NYSDOH) has funded local organizations and county health departments. The goal is to implement multi-component evidence-based policies, place-based strategies, and promising practices to increase demand for and access to healthy, affordable foods and opportunities for daily physical activity for all New Yorkers. The Obesity Prevention Center for Excellence (OPCE), led by JSI Research & Training Institute, Inc. (JSI) strengthens the CHSC Initiative’s collective impact by providing technical assistance, training, resources, and a network to collaborate.

7 STRATEGIES

1. Revise, implement, and assess local wellness policies to improve the school environment.
2. Establish Comprehensive School Physical Activity Programs (CSPAP).
3. Increase access to healthy, affordable foods and increase school districts’ ability to meet federal nutrition standards for foods sold outside of school meals.
4. Restrict food marketing to children.
5. Increase access to healthy, affordable foods in communities.
6. Increase adoption and use of food standards and procurement policies that increase healthy foods in community sites and settings.
7. Adopt and implement Complete Streets policies, plans, and practices to increase access to opportunities to walk, bike, and roll.

26 GRANTEES

With grant funding, JSI and its partners (Alliance for a Healthier Generation, PedNet, University of Rochester, and Sasaki Associates) support the 25 grantees and their partners in CHSC efforts.

Visit OPCE online at: www.nyopce.com

Organizations:
- Cornell Cooperative Extension of Sullivan County
- Nepperhan Community Center, Inc.
- County of Orange
- Rockland County Department of Health
- Western Suffolk BOCES

*Organization has multiple grants
^ JSI is one of the 26 grantees
## BEST PRACTICE OBJECTIVES

Published in 2011, the Community Design Manual establishes best practices and guidance for Orange County communities by providing a set of objectives around three key areas: Nature, Links, and Communities. Based on these three overarching themes, the Manual describes the types of preferred development patterns and explains in detail the tools and actions necessary to construct an implementation strategy. These Complete Streets projects described in further detail in the following pages in Newburgh and Port Jervis exemplify many of the aims identified in the Orange County Community Design Manual whether to protect natural resources and link parks, to design for pedestrians and bicycles and traffic-calm roads, or to promote context-sensitive design and create “main street” environments.

<table>
<thead>
<tr>
<th>NATURE</th>
<th>LINKS</th>
<th>COMMUNITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CREATE THE URBAN FOREST</strong></td>
<td><strong>MAXIMIZE CONNECTIVITY</strong></td>
<td><strong>CREATE DIVERSITY OF USES</strong></td>
</tr>
<tr>
<td>• Landscape parks and plazas</td>
<td>• Create a connected street network</td>
<td>• Integrate neighborhood civic uses</td>
</tr>
<tr>
<td>• Create green streets</td>
<td>• Create new roads and connections into and between developments</td>
<td>• Create diversity of housing types</td>
</tr>
<tr>
<td></td>
<td>• Create a trail network</td>
<td>• Provide for flexible use/mixed-use</td>
</tr>
<tr>
<td><strong>CREATE LINKED OPEN SPACES</strong></td>
<td><strong>DESIGN STREETS FOR PEOPLE</strong></td>
<td><strong>CREATE BEAUTIFUL NEIGHBORHOODS</strong></td>
</tr>
<tr>
<td>• Link protected resource areas on individual parcels</td>
<td>• Design streets for pedestrians and bicycles</td>
<td>• Orient buildings to streets</td>
</tr>
<tr>
<td>• Create and link parks and greenways</td>
<td>• Design beautiful streets</td>
<td>• Promote context-sensitive design</td>
</tr>
<tr>
<td><strong>PROTECT NATURAL &amp; SCENIC RESOURCES</strong></td>
<td><strong>MANAGE THE AUTOMOBILE</strong></td>
<td><strong>CREATE PEDESTRIAN-ORIENTED COMMERCIAL AREAS</strong></td>
</tr>
<tr>
<td>• Create resource-specific plans and regulations</td>
<td>• Deal with parking creatively</td>
<td>• Promote mixed-use buildings</td>
</tr>
<tr>
<td>• Mandate conservation subdivisions</td>
<td>• Accommodate transit</td>
<td>• Promote infill development</td>
</tr>
<tr>
<td>• Protect watersheds and freshwater wetlands</td>
<td>• Traffic-calm roads</td>
<td>• Create “main street” environments</td>
</tr>
<tr>
<td>• Protect farmlands</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Americans with Disabilities Act (ADA), enacted on July 26, 1990, provides civil rights protections to persons with disabilities in the areas of employment, state and local government services, and access to public accommodations, transportation, and telecommunications. This legislation mandates that qualified individuals with a disability shall not be excluded from participation in or be subjected to discrimination under any program or activity. This includes a requirement for transportation infrastructure to accommodate the needs of disabled individuals.

The ADA is divided into five parts, and the ADA transition plan is a part of Title II: Public Services. This title prohibits state and local governments from discriminating against persons with disabilities or from excluding participation in or denying benefits of programs, services, or activities to persons with disabilities.

Municipalities must conduct a self-evaluation that identifies barriers in programs and activities that prevent persons with disabilities from access, including an evaluation of policies and practices. The ADA Transition Plan establishes the steps necessary to complete modification identified throughout the self-evaluation which must include an inventory of pedestrian facilities and any physical barriers or other problems preventing access by disabled individuals, as well as a schedule and budget for completing required modifications. The ADA Transition Plan identifies barriers and establishes a framework for how they will be addressed.
PROJECT OVERVIEW

The corridors in both study areas overlap with the Cities' fitness trails and aim to enhance recreational activities. Additionally, the corridors provide connections to various amenities, such as grocery stores and health centers. Improving the streetscape experience for non-motorists will enhance these connections and provide safe and enjoyable routes for bicyclists, pedestrians and transit users to access amenities throughout both Newburgh and Port Jervis.
Lake Street, Newburgh
South looking view of Lake Street.

**CITY OF NEWBURGH PROJECT CORRIDOR**

The Newburgh Complete Streets project aims to increase connectivity between recreational opportunities, improve access to multiple modes of transportation for all ages and abilities, and foster healthy lifestyles. The project focuses on Lake Street and Lake Drive. The map on page 14 shows the exact study area addressed by this project.

Lake Drive, Newburgh
Overpass on Lake Drive. The damaged culverts and street have been identified for repair.

Muchattoes Lake, Newburgh
View of Muchattoes Lake.
CITY OF PORT JERVIS
PROJECT CORRIDOR

The Port Jervis Complete Streets project aims to improve access to multiple modes of transportation for all ages and abilities, foster healthy lifestyles, and enhance the downtown streetscape to make it a more attractive destination. The project focuses on Pike Street, Front Street, and Jersey Avenue corridors, as shown in the adjacent map.

Jersey Avenue, Port Jervis
View looking down Jersey Avenue.

Sussex Street, Port Jervis
View of Sussex outside of City Hall represents typical street cross-section with two-way traffic and parking.
PUBLIC DESIGN WORKSHOPS

Workshops were convened in each community to gather public input and develop alternative streetscape configurations with community stakeholders in a hands-on process. During each workshop members of the consultant team, Orange County, and City staff gathered on-site data through field work. Additionally, the team gathered community input from residents through informal discussions on the street and more structured visioning exercises during multiple design workshops throughout the day. Information gathered during these exercises was captured in the design alternatives and helped to guide recommendations.

RECOMMENDATIONS SUMMARY

Based in part on the public workshops and input from local professional staff, the following concepts provide a unique Complete Streets vision for two cities that, while share a similar aim which is to create a healthier community, require different strategies. Some of the issues that were considered during the design process included:

- Vehicular movement and volumes;
- Current and future transit connections/amenities;
- Pedestrian and bicycle connections to adjacent and regional community amenities;
- Parks, schools, libraries, churches, trails, and other cultural and natural resources
- Pedestrian-friendliness of the corridor, including sidewalks, street furniture, lighting, crosswalks, and other pedestrian amenities;
- Short and long-term strategies to enhance access;
- Parking conditions; and,
- Existing green infrastructure condition and needs.
CITY OF NEWBURGH RECOMMENDATIONS

CITY OF PORT JERVIS RECOMMENDATIONS
COMPLETE STREETS CASE STUDIES

The New York State Complete Streets Report released in 2014 highlights best practices and case studies of complete street projects constructed throughout New York State. There are two examples which are particularly comparable to the complete street design efforts in Port Jervis and Newburgh.

CANTON VILLAGE RECONSTRUCTION PROJECT

The first example is the Canton Village Reconstruction Project which focused on revitalizing a one-mile stretch of Route 11 in Canton, NY. This project aimed to address safety concerns by improving pedestrian and bicycle access to the downtown district while improving pavement conditions and stormwater management techniques. The redesign of the portion of Route 11 which runs through downtown Canton improved traffic flow and made the streets safer for all users. Additionally, the revitalization project is expected to improve the long-term economic stability of Canton as a whole.
**GREAT NECK ROAD PROJECT**

The Great Neck Road project located in the Village of Great Neck Plaza is the second example. Increasing concerns from the public regarding safety along the corridor prompted officials to address the problem using complete street design principles. The project aimed to "reduce vehicle speeds, improve the downtown environment and economic viability, enhance walkability and accommodate bicyclists and transit vehicles." After a thorough public visioning process, officials recommended and implemented a road diet to improve safety along Great Neck Road. A reduction of travel lanes and the addition of traffic calming elements resulted in a safer and more aesthetically pleasing street which is attractive to all users, including pedestrians, bicyclists, and transit users.
COMMUNITY DESCRIPTION

Newburgh is a 3.8 square mile city with a population just under 30,000. It is located on the banks of the Hudson River in the northeast portion of Orange County, approximately 60 miles north of New York City.

EXISTING CONDITIONS

The Newburgh Complete Streets project aims to increase connectivity between recreational opportunities, improve access to multiple modes of transportation for all ages and abilities, and foster healthy lifestyles. The project focuses on Lake Street and Lake Drive.

An existing conditions analysis provides a base for street recommendations. Examining the current state of the study area, surrounding land uses, key destinations, and community desires informs recommendations which reach the project goal.
TRAFFIC AND ROADWAY CONDITIONS

Based on available data listed by New York State Department of Transportation, the portion of Lake Street within the study area sees Average Daily Traffic volumes of 14,347 vehicles.\(^{15}\) Volumes on adjacent roadways are generally less than Lake Street.

Newburgh Project Corridors AADT and Functional Class

<table>
<thead>
<tr>
<th>ROAD</th>
<th>AADT VOLUME</th>
<th>FUNCTIONAL CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Street (NYS Route 32)</td>
<td>14,347</td>
<td>Principal Arterial Expressway</td>
</tr>
<tr>
<td>Washington Terrace</td>
<td>11,167</td>
<td>Major Collector</td>
</tr>
<tr>
<td>Washington Street</td>
<td>5,957</td>
<td>Major Collector</td>
</tr>
<tr>
<td>S. William Street</td>
<td>5,702</td>
<td>Major Collector</td>
</tr>
<tr>
<td>Lake Drive</td>
<td>2,135 (based on short count 2014)</td>
<td>Local Street</td>
</tr>
</tbody>
</table>

The large width of Lake Street facilitates speeding and dangerous traffic movements. Sidewalks tend to be in poor condition with few amenities such as street trees. In the current state, the poor condition of sidewalks and characteristics of motor vehicle do not make Lake Street an attractive corridor for bicyclists, pedestrians, or transit users.
LOCAL AND REGIONAL KEY DESTINATIONS

A main goal of complete street projects is to create safe connections for all modes of travel to local and regional destinations. Stakeholder and public engagement efforts revealed local and regional key destinations in need of safe connections for bicyclists and pedestrians. These destinations are:

Local:
- Muchattoes Lake
- Delano–Hitch Park
- Newburgh Armory Unity Center
- Newburgh Housing Authority developments
- Save-A-Lot
- Health Center
- Motorcyclepedia Museum

Regional:
- Hudson River via future Quassaic Creek Trail
- Snake Hill
- Downtown Newburgh

Muchattoes Lake, Newburgh
View of Muchattoes Lake.

Lake Street, Newburgh
Intersection at Lake Street and S. William Street.
LAND USE

The current land uses are shown in the map to the right. Most land uses line the study area corridors. Several large residential complexes are located west of Lake Muchattoes, while the commercial uses and public services tend to line Lake Street. Open space can be found along the lakefront as well as east of Lake Street, where Delano-Hitch Park is located.

The 19-acre Muchattoes Lake is a center piece of this project. It is a man-made lake created in 1912 by damming a portion of Quassaick Creek for mill use (Dickson Mill). Muchattoes Lake was once used for ice skating, but due to limited public access it is not currently used for active recreational purposes. Future redevelopment in this area needs to be sensitive to the environment around the lake and recapture green space and make the lake accessible for public use. It is recommended that future development provide easement buffers around the lake in order to achieve these open space and environmental goals. It is important to note Lake Muchattoes is partially owned by a housing development and improvements may be contingent upon the owner’s cooperation and willingness to agree to easements. The nearby properties that surround Lake Muchattoes Lake contain a combination of residential and commercial uses.

The Lake Street Mixed-Use Development opportunity area, located along Lake Street, east of Lake Muchattoes Lake, currently contains a shopping center that has a number of vacant storefronts and is in need of redevelopment. The area’s proximity to open space, the lake and nearby commercial areas makes it a prime location for commercial and/or residential use.

The City of Newburgh adopted a Future Land Use Plan in 2011. This plan outlines a future where much of the commercial space along Lake Street is converted to a mixed-use area, integrating both residential and commercial properties along the corridor. A mixed-use environment tends to encourage non-motorized forms of travel. Therefore, it is important to transform the corridors to include complete street designs to make the area attractive and safe for pedestrians and bicyclists.
BICYCLING

STRAVA TRENDS

Strava is both a website and mobile application which tracks a number of athletic activities, including bicycling, using GPS. Strava Labs, a data engineering subset of the company, produces heat maps showing bicycling density on city streets. This heat map was used to create the map to the right which visualizes common bicycling routes in Newburgh used by Strava application users.

Lake Street and Washington Terrace, both of which fall within the study area, show a significant amount of bicycle use. Implementing complete streets practices along these roads will increase safety for bicyclists both on the roads themselves and at major intersections and crossings along the study corridor. Additional bicycle facilities will also increase access to the Fitness Loop, Muchatooes Lake, Lake Drive, and the commercial areas along Lake Street.
PUBLIC TRANSIT

The map to the left shows a comprehensive view of the public transit system within and surrounding the Newburgh complete streets study corridor. Only one bus route, the Newburgh/Beacon Bus Corporation South Side route (indicated by the orange route) runs along portions of the complete streets corridor. The bus is briefly on Lake Street as it moves between Lake Drive and South William Street, runs along a portion of Lake Drive, and crosses Lake Street as Washington Terrace transitions to Washington Street.

Complete streets practices at the transit station on Lake Drive and at the intersection of Lake Street, Washington Terrace, and Washington Street will improve both pedestrian and bicyclist access to the public transit system running throughout the City.
PUBLIC WORKSHOPS

The design team conducted a full day site visit on Wednesday, September 14th, 2016 which included meetings with City staff and multiple public design workshops. The day began with a walking tour of the complete streets study corridor, guided by City staff, to examine and document existing conditions of the site and ultimately help inform design recommendations for complete streets interventions.

The design team then hosted a listening session to introduce the project and invite attendees to describe their conceptions of the corridor and identify related opportunities or issues. There were two, one-hour long design workshops located in the Newburgh City Hall during the afternoon in which the public was invited to voice their opinions on the project and provide their personal visions for complete streets throughout the study area. There were a total of 9 attendees at the two public design workshops.

Design Workshop 09/14/2016, Newburgh
Consulting team, City staff, residents and business leaders discussing the conditions of the Lake Street corridor.
WHAT IS A HEALTHY AND ACTIVE STREET?

During the design workshop, the team asked the participating public to list characteristics of healthy, active streets. The following is a list of the features collected during the design workshop:

- Sidewalks
- Crosswalks
- Street lights
- Traffic lights
- Pedestrian safety
- Slower traffic speed
- Traffic modes that work together
- Increased foot traffic
- Comfortable streets to walk on
- Parking
- Bike lanes (protected)
- Stormwater management
- Attractive streets
- Trees
- Green infrastructure
- Connections
- Bike routes
- Public transit services
- Calm streets
- Connections that increase access to health care and physical fitness opportunities
- Connections between lots
- Trash receptacles
- Road diet
- Active street furniture
- Mid-block crossings

WORKSHOP SUMMARY

After an intensive internal planning and design exercise, the consulting team presented renderings and illustrations of alternative concepts for the corridor in the evening and invited the public to review the conceptual designs and provide feedback. This workshop format provided a good balance between community input and professional skills, resulting in informed and desired design alternatives.
DESIGN ALTERNATIVES

The initial and primary aim of the Newburgh concept plan was to develop a safer streetscape. The existing 5 lane roadway has acted as a barrier between the recreation facilities and health care services on the east side of Lake Street from the residences and outdoor amenities on the west. The new concept offers a softer landscape, provides improved accessibility and safety, and encourages greater activity. By identifying desired destinations and addressing the present issues, such as a lack of pedestrian-scaled streetscape, the new concept provides an almost campus-like feel to the community. It is recommended that this plan can be phased in, beginning with addressing ADA compliance on sidewalks and ramps. Utilizing paint or street furniture, the City can test the recommendations for a year before installing or while searching for funding. Once installed, we recognize that the corridor may be further developed and require reconfiguring the street (i.e. removing the cycle track) to better accommodate the expected use and traffic to the area at which point the City, somewhere through the permitting process, would need to acquire an easement behind the fronting Lake Street properties to relocate the trail along the lake and retain the loop.
Broadway, Newburgh

A view of Broadway shows a dense mix of development and temporary pedestrian bump-outs to demonstrate and test possible new street-level facilities.

Muchattoes Lake, Newburgh

View of Muchattoes Lake.
OVERALL CONCEPT PLAN

The complete street recommendations take into consideration the general character, current land uses, and future trends of the area surrounding the corridor. Both public input and expert analysis of the current conditions along the Lake Street corridor revealed an overbuilt roadway, making it an ideal candidate for a road diet. Reducing the number of travel lanes provides sufficient space for bicycle and pedestrian facilities, stormwater management elements, and vegetation without hindering motorists’ ability to move through the corridor.

The concept plan recommends formalizing the designated fitness trail by constructing a multi-use path around Muchattoes Lake and Lake Drive with future spur trails along Quassiac Creek. If implemented, these facilities will increase the number of recreational opportunities for both pedestrians and bicyclists as well as help connect residential areas to amenities and key destinations throughout the area.

A number of park enhancements are recommended along the Quassiac Creek Trail and multi-use path to provide open space destinations for all recreational users. These parks should include various amenities for visitors such as benches, waste and recycling receptacles, trees, bike racks, water stations, and picnic tables.

Crossing improvements should be included in the Lake Street Road Diet to enable bicyclists and pedestrians to easily and safely access amenities on both sides of the street including grocery stores, healthcare, and recreational facilities. Recommended intersection crossing improvements are located at Washington Terrace/Lake Street and Lake Street/South William Street. A mid-block crossing along Lake Street at the Quassiac Creek is vital to the creation of a safe and well-connected trail along the creek.

The following recommendations included in the cross-section and plan view alternatives were created based off these concept plans.
HEALTHY STREETS
A multi-use path, new parks, and improved lake access transform Lake Drive into a recreational destination

IMPROVED CONNECTIVITY
Safer intersection crossings, traffic calming measures, and a road diet improve connectivity between neighborhoods along Lake Street

NEWBURGĦ COMPLETE STREET
RECOMMENDATIONS

- Pedestrian Facilities
- Bike Facilities
- Multi-Use Path
- Bike Connections (future)
IMPROVED CONNECTIVITY

- The width of Lake Street can be intimidating for some users. Safer crossings will improve the connection between the east and west sides of Lake Street.

- Implementing a road diet on Lake Street will encourage non-motorized travel throughout the area. This would involve decreasing the number of lanes from 5 to 3 to provide space for bike facilities.

- Safety and accessibility enhancements at intersections will improve connectivity for bicyclists and pedestrians.

INTERSECTION CROSSING OPTIONS

Textured Intersection
more extreme alternative would be textured and tabled for traffic calming.

Pedestrian Scramble
techniques are used to stop traffic in all directions while pedestrians cross an intersection in any direction, including diagonally.

Bike Crossings
are exclusive bike facilities that combine the user experience of a separated path with the on-street infrastructure of conventional bike lanes.

Curb Extensions
shorten crossing distance as well as calm traffic. Also carves out parking spaces. Chicanes would also achieve this purpose.
HEALTHY STREETS

- Lake Drive is a residential street bounding a largely undiscovered natural resource, Lake Muchattoes. Improving access to the Lake will encourage use of the fitness loop.

- Recommendations expand recreational amenities along Lake Drive, calm traffic, and improve connections to Lake Street.

- As recommendations are implemented, Lake Drive has the potential to become an important recreational resource for local residents and a major destination for Newburgh residents.

New Park Space
The construction of new park spaces on Lake Muchattoes and along the fitness loop will draw users to the area to take advantage of the recreational opportunities in the area.

PEDESTRIAN-SCALE STREETSCAPE IMPROVEMENTS

Multi-Use Paths
are separated from roadways and are designated for use by bicyclists and pedestrians.

Fitness Amenities
along the fitness loop, such as permanent, low maintenance outdoor exercise equipment, will promote healthy lifestyles in the City of Newburgh.

Lake Access
improvements will draw bicyclists and pedestrians to Lake Muchattoes to take in the views and enjoy the recreational opportunities in the area.

Green Infrastructure
In addition to slowing, storing, and filtering stormwater runoff, green infrastructure enhances the pedestrian experience.
CROSS-SECTIONS

The following cross-sections for Lake Drive and Lake Street were created based on the existing right-of-way (ROW). The treatments in each alternative were driven by input from the public and City staff regarding the vision and needs for the corridor. The following designs do not need to be considered individually. Elements of multiple cross sections can be combined into the final design provided the treatments fit within the existing ROW. Additionally, treatments along the length of the streets can differ as the character and needs of the corridors change. If multiple treatments are chosen for a street, it is important to use good judgment and attention to detail to ensure all travel modes flow smoothly down the length of the study corridors.

Lake Drive, Newburgh

View of Lake Drive shows sidewalk on one side and wide, unmarked vehicular travel lanes.
CITY OF NEWBURGH

CROSS-SECTION LOCATIONS

- Lake Drive alternatives
- Lake Street alternatives
- Existing condition only
LAKE DRIVE
There are two alternative designs for the ROW on Lake Drive. They are oriented as if the viewer is looking up the street to the North with Lake Muchattoes to the right.

ALTERNATIVE A
This alternative emphasizes open space and stormwater management techniques. The roadway consists of two travel lanes, one in each direction, flanked on each side my stormwater management facilities. This alternative recommends a 12-foot multi-use path on the eastern side of the road, closer to Lake Muchattoes, which can be used by both pedestrians and bicyclists. The existing ROW provides additional space for a five foot sidewalk on the opposite side of the street, allowing for pedestrian travel.

Lake Drive: Alternative A
ALTERNATIVE B

The second alternative is similar to the first in that it provides a multi-use path on the lakeside of the street and pedestrian facilities on the opposite side of the street. Lake Drive also remains a two-lane street, with 10-foot travel lanes in either direction. One large difference is that this option provides parallel parking along the eastern side of the street. The parking lane and stormwater management treatments act as a buffer between moving traffic and those on the multi-use path. A street tree buffer on the opposite side between the roadway and sidewalk is recommended for both shade and to add distance between pedestrians and moving vehicles.
LAKE STREET

There are three alternative designs for the 90-foot ROW along Lake Street. The width of the design options varies slightly as it is expected that the vegetated buffer will vary along the corridor. All designs can be altered slightly to fit within the existing ROW. The cross-sections are oriented as if the viewer is looking up the street to the North with Lake Muchattoes to the left. The large ROW and widespread public support of a road diet provides a perfect opportunity to implement multiple complete street elements along Lake Street.

ALTERNATIVE A

For option 1, motorists will have access to two 11-foot travel lanes, one in each direction, and one center turn lane to facilitate left-hand turns. The 16-foot multi-use path on the west side of the corridor provides easy access to the multi-use path fitness loop proposed on Lake Drive for both bicyclists and pedestrians. An 11-foot stormwater management planting is placed between the roadway and multi-use path to separate motorized and non-motorized travel modes. Additional pedestrian facilities located on the eastern side of Lake Street will enable pedestrians to easily access the recreational and commercial attractions in the area.
**ALTERNATIVE B**

Option 2 successfully separates, and buffers, all modes of travel. Pedestrians coming from the lake to the west or the commercial area to the east can take advantage of sidewalks on both sides of Lake Street. A two-way protected bike lane is recommended on the west side of the street, enabling cyclists to easily access the multi-use path fitness loop proposed on Lake Drive. Bikes are separated from a southbound travel lane by an 11-foot buffer complete with stormwater management plantings. The two travel lanes are separated by a vegetated median which doubles as a turning lane at necessary intersections and commercial areas along the corridor. The abundance of open space, street trees, and dedicated facilities will transform Lake Street into an inviting corridor for non-motorized modes of travel.
ALTERNATIVE C

The final alternative design trades open green space for parallel parking lanes on both sides of the corridor. Pedestrians would be accommodated with large sidewalks and street buffers on either side of the street. A two-way parking-protected bike lane is recommended on the west side of the street. Consistent with the need for a road diet, this alternative removes one travel lane from each direction and provides a center turn lane for vehicles turning left.
PLAN VIEWS

Plan views were created for two segments along the complete street study corridor. The segment locations, shown by the map on the adjacent page, were chosen based on the importance of and the need for pedestrian and bicycling improvements in these specific locations.

The plan views help illustrate the potential of the corridor if complete street elements were implemented along the streets.

The two segments chosen were:

- Lake Street at South Williams Street
- Lake Street at the Muchatooes Lake Overlook and Quassiac Creek Trail crossing

Lake Street, Newburgh
View of Lake Street over the Quassaic Creek before the bridge was reduced to two lanes.

Lake Street, Newburgh
A representative view of the Lake Street streetscape with four lanes, sparse trees and buildings set back from the roadway.
LAKE STREET AT SOUTH WILLIAMS STREET
LAKE STREET OVERLOOK AT QUASSIAC CREEK
COMMUNITY DESCRIPTION

The City of Port Jervis, also known as the River City or the Gateway to the Upper Delaware River, is a small city, just 2.7 square miles, located in the southwest portion of Orange County along the Delaware River and New York/Pennsylvania state border. In 2010, the City was home to 8,828 residents.

EXISTING CONDITIONS

An existing conditions analysis provides a base for street recommendations. Examining the current state of the study area, surrounding land uses, key destinations, and community desires informs recommendations which reach the project goal.

The Port Jervis complete streets project aims to improve access to multiple modes of transportation for all ages and abilities, foster healthy lifestyles, and enhance the downtown streetscape to make it a more attractive destination. The project focuses on Pike Street, Front Street, and Jersey Avenue corridors.
**TRAFFIC AND ROADWAY CONDITIONS**

Based on available data listed by New York State Department of Transportation, the study corridor generally sees traffic volumes from nearly 8,000 to 10,500 vehicles.\(^{18}\)

### Port Jervis Project Corridors AADT and Functional Class

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<th>ROAD</th>
<th>AADT VOLUME</th>
<th>FUNCTIONAL CLASS</th>
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<td>Principal Arterial Expressway</td>
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</tr>
<tr>
<td>Ball Street</td>
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</table>

Jersey Avenue, Port Jervis
LOCAL AND REGIONAL DESTINATIONS/ CONNECTIONS

A main goal of complete street projects is to create safe connections for all modes of travel to local and regional destinations. Stakeholder and public engagement efforts revealed local and regional key destinations in need of safe connections for bicyclists and pedestrians. These destinations are:

Local:
- Delaware River
- Existing waterfront park
- Future whitewater kayak park
- Local trails
- Train station
- Save-A-Lot
- Downtown Port Jervis
- Library
- Veteran’s Park

Regional:
- Elks-Brox Memorial Park
LAND USE

As shown in the map to the right, the land uses surrounding the study corridors are comprised largely of commercial uses. This is consistent with the area being considered the downtown district of Port Jervis.

Pike Street and the western portion of Front Street are home to many businesses and amenities including restaurants, salons, community centers, and shopping opportunities.

As Front Street transitions to Jersey Avenue, the corridor shifts from primarily commercial activity to a mixed-use district made up of commercial, retail, and residential land uses.

The bicycle and pedestrian recommendations included in this plan are informed by the current land uses and the community vision for the future of Downtown Port Jervis.
**BICYCLING**

**STRAVA TRENDS**

Strava is both a website and mobile application which tracks a number of athletic activities, including bicycling, using GPS. Strava Labs, a data engineering subset of the company, produces heat maps showing bicycling density on city streets. This heat map was used to create the map to the right and visualizes common bicycling routes in Port Jervis used by Strava application users.

Pike Street, a main focus of the Port Jervis complete streets study area, falls under the highest density category. Meaning it is a popular route among Strava bicyclists in the City. Additionally, the western portion of Front Street and the entirety of Jersey Avenue show a significant amount of bicycle use. This heat map shows that people want to, and already do, bike along the study corridor. Improvements to the corridor, such as bicycle facilities and amenities, will increase safety as well as draw more bicyclists to the area. An increase in bicycle traffic along Pike Street, Front Street, and Jersey Avenue would likely be a catalyst for economic development throughout this area of the City.

Pike Street, Port Jervis

Bicyclist on Pike Street south of the railroad illustrates the need to provide bike facilities and safe crossings.
PUBLIC WORKSHOPS

The design team conducted a full day site visit on Monday, September 12th, 2016 which included meetings with Orange County staff and multiple public design workshops. The day began with a walking tour of the complete streets study corridor, guided by Orange County staff, to examine and document existing conditions of the site and ultimately help inform design recommendations for complete streets interventions.

The design team then hosted a listening session to introduce the project and invite attendees to describe their conceptions of the corridor and identify related opportunities or issues. There were two, one-hour long design workshops located in the Port Jervis City Hall during the afternoon. During the public workshop sessions, staff encouraged attendees to articulate the issues and opportunities associated with the project area, describe their vision for the corridor, or otherwise locate specific areas for improvements. Using maps prepared for the workshop and schematic illustrations developed throughout the course of the day residents and staff identified distinctive strategies and recommendations for creating an attractive, healthy, and accessible streetscape design. There were a total of 21 attendees at the two public design workshops.

Design Workshop 09/12/2016, Port Jervis
Business owners, residents, and community leaders discuss conceptual complete streets plans in City Hall during workshops.
WHAT IS A HEALTHY AND ACTIVE STREET?

During the design workshop, the team asked the participating public to list characteristics of healthy, active streets. The following is a list of the features collected during the design workshop:

- Trees
- More “green”
- Walkable
- ADA compliance
- Upgraded development
- Street furniture
- Wide, well-maintained sidewalks
- Connectivity
- Destinations
- Wayfinding
- Things to make people “linger”
- Frequent attractions
- Encourages people to explore and interact
- Bikes accommodated
- Smoke-free spaces
- Safe spaces for multiple modes
- Bike rentals/bike share
- Tourism amenities
- Bike lanes
- Downtown trail connections
- Wide sidewalks
- Trash/recycling bins and dog bags
- Resilient sidewalk materials

WORKSHOP SUMMARY

After an intensive internal planning and design exercise, the consulting team presented renderings and illustrations of alternative concepts for the corridor at the Common Council Workshop. The public was invited to review the conceptual designs and provide feedback. This workshop format provided a good balance between community input and professional skills, resulting in informed and desired design alternatives.
DESIGN ALTERNATIVES

Port Jervis sees itself as a gateway to Upstate, to recreation opportunities like hiking, biking, and kayaking. Anticipated zoning improvements to attract new businesses. A new kayak park. Port Jervis is connected to NYC through regular rail transit serviced by Metro-North Railroad and New Jersey Transit. The common theme heard was the desire to have an attractive and vibrant downtown. An important component of this project is to develop a greater pedestrian oriented space that would encourage visitors to “linger.” To emphasize a healthy and active streetscape the design features increased sidewalk space and incorporates greater green infrastructure.

Implementation of the plan will require a long-term commitment from the community and city staff. Not all of the improvements represented in these plans can currently fit within the existing curb-to-curb or streetscape. As new development occurs along the corridor it is recommended that the city work with the property owner or developer to assess any existing encroachments into the right-of-way and carefully consider proposals to determine where greater public space can be established or enhanced.

The term revitalize perfectly captures the multiple aims of this concept to support healthy transportation options, increase aesthetic and environmental conditions, and attracting visitors and businesses.

Port Jervis Train Station, Port Jervis
Millennium Park, Pike Street, Port Jervis

Storefront, Front Street, Port Jervis
OVERALL CONCEPT PLAN

The complete street recommendations take in consideration the general character, current land uses, and future trends of the area surrounding the corridor. The entirety of Pike Street and the beginning of Front Street are comprised mainly of commercial uses and the City of Port Jervis considers this area to be the Central Business District (CBD). Additional foot traffic along the corridor brought by recommended crossing improvements, park and open space enhancements, bicycle and pedestrian facilities and amenities will further establish this area as an important economic generator for the City.

The CBD currently ends at the Front Street/Jersey Avenue fork and the site of a recommended future public promenade. This public promenade will provide a central attraction to the city’s urban core and a smooth transition from the CBD to the existing mix of public services, commercial services, mixed-use residential, and residential land uses along Jersey Avenue.

Potential Railroad Crossing, Port Jervis

Improving the currently closed railroad crossing at Fowler Street to 4th Street and Railroad Ave with create a needed connection and safer access to Riverside Park.

Crossing improvements are vital to transforming the corridors into complete streets. Currently, there is no direct connection between Riverside Park and the complete street study corridor. Establishing an at-grade railroad crossing to connect Fowler Street and Fourth Street will enable bicyclists and pedestrians to easily and safely access Riverside Park and the Delaware River. This connection will become increasingly important after an expansion of Riverside Park and the creation of a whitewater recreation park on the Delaware River. Additional crossing improvements within the CBD at the intersections of Pike Street/Hammond Street and Sussex Street/Front Street will improve safety conditions for non-motorized users.

The following recommendations included in the cross-section and plan view alternatives were created based off these concept plans.
PORT JERVIS COMPLETE STREET

RECOMMENDATIONS

- **Pedestrian Improvements**
- **Bike Improvements / Connections**
- **Trail System (future)**
- **Bike Boulevard (future)**

**CONNECT PIKE STREET**
Improved pedestrian and bike facilities reinforce the fitness loop and connections to downtown.

**ENLIVEN DOWNTOWN**
Pedestrian-scale improvements expand public space and encourage people to gather downtown.

**CALM JERSEY AVENUE**
Traffic calming measures slow motor vehicles and enhance pedestrian experience.
CONNECT PIKE STREET

- The rail overpass disconnects Pike Street from Jersey Avenue and Downtown Port Jervis. Improvements to Pike Street should strive to better connect bicyclists and pedestrians to the downtown district.

- Increasing active transportation options and connectivity between Pike Street, Front Street and the train station will encourage more people to utilize the downtown area of Port Jervis.

- Suggested improvements include upgraded and expanded pedestrian infrastructure, new bike facilities, and development of a new park to create additional destinations along Pike Street.

BICYCLE FACILITY TYPES

Shared Roadways
are designated by pavement markings, signage, or traffic calming measures intended to reduce vehicle speeds or volumes.

Separated Bikeways
use signage and striping to delineate the right-of-way assigned to bicyclists and motorists. Facility examples include bike lanes and buffered bike lanes.

Cycle Tracks
are exclusive bike facilities that combine the user experience of a separated path with the on-street infrastructure of conventional bike lanes.

Multi-Use Paths
are separated from roadways and are designated for use by bicyclists and pedestrians.

Bike Share
Establishing a bike share system in Port Jervis would increase the mobility of residents and visitors, improve connections between the rail station and downtown, and encourage active transportation.
ENLIVEN DOWNTOWN

- Port Jervis’ downtown is compact, rich with architectural and cultural resources, and within walking distance to the Metro North station and incredible natural resources.
- Pedestrian-scale improvements that create an accessible, lively, human-scale environment will increase downtown’s walkability and encourage more people to spend time in Port Jervis.

Flexible Public Space (Festival Streets)
Establish flexible public space in downtown where the street can easily be converted to a pedestrian-only space to support markets, concerts, and festivals.

PEDESTRIAN-SCALE STREETSCAPE IMPROVEMENTS

Public Spaces are destinations. They create opportunities for socializing; they provide important space events; and, they encourage people to spend time outdoors.

Accessible Sidewalks are critical components of a complete street. Accessible sidewalks and crossings ensure all ages and all abilities can use and enjoy the street.

Street Furniture can be permanently installed on the sidewalk or temporarily installed on the street to expand the pedestrian zone.

Art installations can help improve the pedestrian experience along street corridors by creating an attractive streetscape while separating incompatible travel modes.
CALM JERSEY AVENUE

- Traffic calming measures are an opportunity to slow car traffic, expand pedestrian space, and incorporate green infrastructure.

- East of Fowler Street, Jersey Ave is characterized by a larger ROW, low density development, and fast moving cars. Traffic calming along this section will improve the travel experience for pedestrians and bicyclists.

- Improved sidewalk and crossing infrastructure will better connect the Port Jervis community to food resources and recreational amenities downtown.

Green Infrastructure
In addition to slowing, storing, and filtering stormwater runoff, green infrastructure enhances the pedestrian experience.

TRAFFIC CALMING TECHNIQUES

Curb Extensions
are used to increase visibility and shorten crossing distances.

Mini Roundabouts
can be used to slow traffic on local streets, making them safer and more enjoyable for non-motorized travel modes.

Speed Humps/Tables
work as traffic calming devices by slowing motorized vehicles along a corridor.

Textured Shoulders
are pedestrian-level streetscape treatments which double as a traffic calming element.
CROSS-SECTIONS

The following cross-sections for Pike Street, Front Street, and Jersey Avenue were created based on the existing right-of-way (ROW). The treatments in each alternative were driven by input from the public and City staff regarding the vision and needs for the corridor. The following designs do not need to be considered individually but may be interchangeable in most instances. Elements of multiple cross sections can be combined into the final design provided the treatments fit within the existing ROW. Additionally, treatments along the length of the streets can differ as the character and needs of the corridors change. If multiple treatments are chosen for a street, it is important to use good judgment and attention to detail to ensure all travel modes flow smoothly down the length of the study corridors.
PIKE STREET
There are four alternative designs for Pike Street. The width of the design treatments varies slightly moving along the corridor and ranges between 62 feet to 67 feet. Since the width varies by just 5 feet, all designs can be altered slightly to fit within the ROW. The cross-sections are oriented as if the viewer is looking up the street to the North with the train station to the left.

ALTERNATIVE A
The first alternative provides wide sidewalks on either side of the street with street tree buffers separating pedestrians from moving traffic. There are two travel lanes, one in each direction, and a two-way cycle track protected from motorized vehicles by flexible delineators. The addition of other bicycling amenities, such as bike racks, will attract bicyclists to the area while also increasing foot traffic along the commercial corridor. It is important for bicycles to remain on the east side of the street so they can access Front Street and Jersey Avenue without having to interact with the MacArthur Circle, which loops up and over Pike Street.
ALTERNATIVE B

Option two is similar to the first alternative for both pedestrians and motorists. There will be 7- to 10-foot sidewalks on both sides and one travel lane in each direction. Bicyclists will be provided one-way 6-foot bike lanes between the vehicles and vegetated buffers.
ALTERNATIVE C

The third alternative design accommodates pedestrians with sidewalks on either side of Pike Street. They are separated from the parallel parking lanes on both sides of the street by five-foot street tree buffers. It is proposed that the parallel parking lanes include bump outs at intersections to shorten crossing distances and increase visibility for all users. The two travel lanes should be marked as shared roadways to allow for bicycle use.
ALTERNATIVE D

The final alternative provides separate facilities for all travel modes. Pedestrians have access to sidewalks on both the East and West sides of the street and are separated from the roadway by street tree buffers. This alternative reserves one lane from parallel parking on the west side of the street, accompanied by two travel lanes. A 12-foot two-way protected cycle track is recommended for the East side of Pike Street. Once again, the bicycle facility should remain on this side of the corridor so bicyclists can avoid MacArthur Circle when traveling throughout the complete street study corridor.
FRONT STREET
There are two alternative designs for Front Street’s ROW. The cross-sections are oriented as if the viewer is looking to the East toward Jersey Avenue.

ALTERNATIVE A
The roadway in the first design alternative includes two travel lanes shared between bicycles and vehicles and one parallel parking lane on the north side of the street. Sidewalks are provided for pedestrians on both sides and include vegetative elements such as street trees and planters.
**ALTERNATIVE B**

The second alternative alters the roadway to allow for additional pedestrian and public space on the northern side of Front Street. Parking is removed in favor of street furniture, such as benches and bike racks, and additional space for sidewalk cafes and other public activities. Street trees and planters are recommended to shield those on the sidewalk from the shared travel lanes, creating an inviting corridor that will encourage pedestrian travel throughout the area.
JERSEY AVENUE
Based on the existing infrastructure, character of the corridor, and public input, there is one generalized design for the ROW on Jersey Avenue. The cross-section is oriented as if the viewer is looking East toward Main Street with Riverside Park on the right.

ALTERNATIVE A
Pedestrians will have eight-foot and six-foot sidewalks on either side of the street which should include street furniture for both bicyclists and pedestrians, such as bike racks and benches. Vegetated buffers are recommended to separate pedestrians from moving traffic. Shared travel lanes will enable bicyclists to move safely through the corridor and access key destinations in the area, such as Riverside Park. One parking lane is provided on the North side of Jersey Avenue.
PLAN VIEWS

Plan views were created for two segments along the complete street study corridor. The segment locations, shown by the map on the adjacent page, were chosen based on the importance of and the need for pedestrian and bicycling improvements in these specific locations.

The plan views help illustrate the potential of the corridor if complete street elements were implemented along the streets.

The two segments chosen were:

- Pike Street at Hammond Street and includes the recommended pocket park
- Jersey Avenue at the Save-a-lot grocery store between Seward Avenue and Pennsylvania Avenue

Jersey Avenue at Save-a-lot Grocery, Port Jervis

Pike Street at Hammond Street, Port Jervis
CITY OF PORT JERVIS

SEGMENT PLAN VIEWS

- Orange: Pike Street at Hammond Street/Pocket Park
- Green: Jersey Avenue at Save-a-lot Grocery

0 250 500 1,000 FEET

N

FUTURE WATER SPORTS PARK

DELAWARE RIVER

NEVERSINK RIVER
PIKE STREET AT HAMMOND STREET/POCKET PARK
JERSEY AVENUE AT SAVE-A-LOT GROCERY
## APPENDIX A: COST-ESTIMATES

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APPENDIX B: OPERATIONS & MAINTENANCE

Streets and associated facilities require regular upkeep in order to maintain their operational efficiency. This section outlines the maintenance activities that are necessary to ensure these facilities remain safe and passable for users. Operations and Maintenance (O & M) activities are generally described and should be honed based on the aims and availability of resources of the community.

Maintenance of the streetscape should be considered during the planning and design phases of proposed improvements to ensure that once implemented, the facility can remain clear of debris and functional. Proper-functioning signage, lighting, and pavements markings are essential to the safety and operation of motor vehicles, as too for bicyclists, pedestrians, and transit use.

IMPORTANCE OF O&M ACTIVITIES

Maintaining the proposed facility to a high standard is important for a variety of reasons, including:

SAFETY

Public agencies have a duty to protect the public welfare by maintaining facilities to a level that reduces potential safety hazards. This includes repairing damage on the bikeway that may pose a tripping hazard, replacing flexible delineators, clearing the bikeway of debris and objects, clearing snow in a timely manner, and preventing ice from forming.

ATTRACTING USE

Well-maintained facilities, with smooth surfaces, current signage, and visible striping and markings will attract and sustain use. An attractive facility increases the livability of the areas served by the bikeway.
LIABILITY
Allowing hazardous conditions to exist along a path or sidewalk exposes a local agency to potential lawsuits.

PROTECTING THE PUBLIC INVESTMENT
Regular preventative maintenance along the facility can extend its lifetime and delay the need for more expensive repairs.

Costs associated with maintenance can be reduced if existing maintenance vehicles, such as street sweepers, can be used. Creating a connected low-stress network reduces maintenance costs, allowing maintenance crews to clear the entire network without needing to travel from one unconnected facility to another. When the facility is being planned, the department who will be responsible for maintaining the new facility should be identified, and budget should be allocated to ensure its continued maintenance.

DRAINAGE CONSIDERATIONS
Drainage is another factor that should be considered during the planning and design phase for a new street-level improvements. The following best practices are recommended to ensure proper drainage:

Street-level improvements that include flexible posts for physical separation do not require alterations to existing drainage infrastructure.

For street-level improvements that use a raised median separator, the provision of breaks in the median allow reuse of the existing drainage system.

For sidewalk and intermediate level facilities, drainage strategies illustrated in the graphic below are recommended depending on the type of facility.
WINTER MAINTENANCE

The winter maintenance of facilities is critically important to ensuring that they remain passable year-round. Winter maintenance should be a planned, regular activity along roadways. Bicycles have different winter needs than motor vehicles—for example, less weight and tire surface area means they are more sensitive to snow and ice—and winter roadway maintenance programs should have specialized practices to respond to these needs.

To prioritize safe conditions for bicyclists year round, there are different strategies and equipment; however, a strategic bikeway snow removal and de-icing program that includes snow removal prioritization is key to the safe and comfortable accommodation of bicyclists in the winter. Best practices include:

- Designing bikeways so that existing snow removal equipment can be used. A conventional 10 foot wide two-way separated bike lane can be cleared by a pick-up truck with a mounted plow. More narrow facilities may require specialized vehicles.

- Develop a connected network of bikeways. This ensures that snow removal equipment can clear the bikeways in a linear fashion without the need to move from one disconnected facility to another.

- Removing bollards during winter months. This minimizes damage that could be caused by plows hitting the posts. Snow accumulating in the buffer areas helps to maintain separation between motor vehicles and the bikeway. The base of the bollards can remain in the pavement to facilitate reinstallation of the posts.

Two-Way Separated Bike Lane (SBL) Snow Management

During winter, snow may accumulate at the edges of the bikeway, reducing its operating width. Snow accumulations (shown in purple) are shown during winter. With each snow event the operating width is further reduced shown by STORM 1, STORM 2, and STORM 3. To maintain a functional operating width of the bikeway, routine clearing after snow events needs to be prioritized.

1. Snow can accumulate within the buffer area to begin after snowfall. Plowing a 9’ wide snowplow can clear the side of the bike lane through routine plowing operations.
2. The snow plow should be placed at the edge of the buffer area to clear the snowfall and maintain a functional operating width.
3. The SBL should be plowed immediately after the lane is clear of snow. Plowing the SBL will ensure that the snow is cleared from the buffer area.
4. Snow plowing should be continuous during the winter season to maintain a functional operating width.
5. As more snow builds up, the operating width of the buffer area may be reduced. Routine plowing after snow events should be prioritized.
6. The operating width of the bikeway should never fall below 6 feet (which is the minimum space required for two bicyclists to pass each other slowly).

A truck-mounted snowplow, with a blade of 9’ is the ideal tool to plow two-Way SBLs. The operating width of SBLs is reduced in winter months due to snow piling up on the edges of the bikeway. The encroachment of snow can be managed through routine plowing after snow events.
**SHARED USE PATH O&M NEEDS**

Routine maintenance of shared use paths is essential to guaranteeing an enjoyable trail user experience. As new sections of trail are constructed, a maintenance schedule should be established in sync.

*Shared-Use Path O&M*  
Maintaining clear and smooth pavement condition, trimming vegetation, and inspecting and repairing signage, lighting and pavement markings are key tasks necessary to maintain the proper functioning of shared-use paths. (Image Source: P. Miner)
GUIDING PRINCIPLES FOR AN EFFECTIVE MAINTENANCE PROGRAM

System Maintenance refers to the care, upkeep and smooth functioning of shared-use paths. If the facility is well maintained and cared for, it will assure both the safety and enjoyment of the residents and visitors who use it. A proper maintenance program will reduce long-term costs by extending the life of the components, and it will also win the continued support of the residents, homeowners, and businesses. Typical annual maintenance activities include:

- Sweeping of the path after the spring snow pack melts
- Shoulder mowing and sweeping operations
- Periodic maintenance and repairs – including seal coating of path surfaces (approximately every 4-5 years on a rotating basis) striping, signage, benches, bike racks, and installation of safety fencing, safety signage, and devices, etc.
- Snow plowing and/or grooming for cross-country skiing
- Bridge maintenance
- Trash removal
- Tree and vegetation trimming
- Crack sealing and repair

The tables on pages 98 and 99 summarize routine, long-term, and seasonal maintenance best practices and the frequency at which they should occur.
GUIDING PRINCIPLES FOR AN EFFECTIVE OPERATIONS PROGRAM

The following guiding principles will help assure the preservation of a first class system:

- Good maintenance begins with sound planning and design.
- Foremost, protect life, property, and the environment.
- Promote and maintain a quality transportation and recreation experience.
- Develop a management plan that is reviewed and updated annually with tasks, operational policies, standards, and routine and remedial maintenance goals.
- Maintain quality control and conduct regular inspections.
- Include field crews, police, and fire/rescue personnel in both the design review and on-going management process.
- Maintain an effective, responsive public feedback system and promote public participation.
- Be a good neighbor to adjacent properties.
- Facilities Maintenance
- A sound maintenance program should include the following elements:
  - Off-Street Shared-Use Pathways
  - Natural Surface / Single Track Trails (part of a future integrated system)
  - Trail-Related Corridors (landscaped and open space areas associated with trails and greenways, including streams and conservation areas)
  - On-Street Bicycle Routes (bike lanes, bike routes, and streets used for biking)
  - Trailheads
  - Sidewalks
  - Wayfinding Signage, Fixtures and Furnishings (on-street and off-street)
  - Regulatory and Safety Signage
  - Tunnels, Pedestrian Bridges, Underpasses, and At-Grade Street Crossings
  - Trail-Related Parks and Features
  - Access Parking and Maintenance Roads
  - Rest Areas
### Maintenance Best Practices

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ACTIVITY</th>
<th>FREQUENCY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ROUTINE MAINTENANCE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sweeping</td>
<td>weekly</td>
<td>Sweeping and removal of garbage and debris.</td>
</tr>
<tr>
<td></td>
<td>Delineator Post Inspection</td>
<td>monthly</td>
<td>Inspect and replace damaged flexible delineator posts.</td>
</tr>
<tr>
<td></td>
<td>Trimming</td>
<td>monthly</td>
<td>Vegetation trimming to provide clear access on a monthly basis.</td>
</tr>
<tr>
<td></td>
<td>Signage Upkeep</td>
<td>bi-annually</td>
<td>Inspect and repair or replace wayfinding signage.</td>
</tr>
<tr>
<td></td>
<td>Restriping</td>
<td>annual</td>
<td>Restripe facilities to maintain high visibility of striping.</td>
</tr>
<tr>
<td></td>
<td>Snow Removal</td>
<td>as-needed</td>
<td>De-ice prior to snow events, and plowing post events.</td>
</tr>
<tr>
<td></td>
<td>Unforeseen Events Remediation</td>
<td>as-needed</td>
<td>Inspection and repair damage post storms, floods, collisions and other unforeseen events.</td>
</tr>
<tr>
<td></td>
<td>Repaving</td>
<td>as-needed</td>
<td>Maintain pavement quality through spot repairs, regular overlays and longer-term repaving.</td>
</tr>
<tr>
<td><strong>FACILITY REPAIR OR REPLACE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resurfacing</td>
<td>10 - 12 years</td>
<td>Replace asphalt or concrete.</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>As needed</td>
<td>Regrade to prevent or eliminate low spots and drainage issues.</td>
</tr>
<tr>
<td></td>
<td>Structures</td>
<td>30 years or as needed</td>
<td>Addition or repair of culverts, bridges, boardwalks, retaining walls, etc., to prevent or eliminate drainage/erosion issues.</td>
</tr>
<tr>
<td></td>
<td>Rerouting</td>
<td>As needed</td>
<td>Reroute trail, if necessary, to avoid environmentally sensitive or overused areas, safety issues, or construction projects.</td>
</tr>
</tbody>
</table>
### Maintenance Best Practices (cont’d)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ACTIVITY</th>
<th>FREQUENCY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEASONAL MAINTENANCE</strong></td>
<td>Regular Inspection</td>
<td>2 times/year</td>
<td>Identify needed repairs of pavement, signs, markings, lighting, etc. Identify areas where potholes or frost are forming, frost upheaval is developing, erosion is taking place, or tree roots are encroaching on the trail corridor. Issues should be repaired promptly. Cracks or potholes can be filled with asphalt or a tar-based sealant.</td>
</tr>
<tr>
<td></td>
<td>Sweeping</td>
<td>2 times/year</td>
<td>Sweeping should occur at least twice annually, with the first instance occurring after the winter thaw to remove salt/sand from the trail.</td>
</tr>
<tr>
<td></td>
<td>Remove debris and litter</td>
<td>Once/month</td>
<td>The frequency of debris removal should increase during the fall and winter months. Natural debris, trash and fallen tree leaves should be swept or blown off of the trail.</td>
</tr>
<tr>
<td></td>
<td>Remove snow and ice</td>
<td>As needed</td>
<td>Prioritize removal by the most heavily used facilities and geographic location. If snow removal is desired, snow removal should be completed immediately following snow events. De-icing agents, such as salt, should be applied during the winter months and after major snow events.</td>
</tr>
<tr>
<td><strong>HABITAT ENHANCEMENT</strong></td>
<td>Vegetative Enhancements</td>
<td>See Description</td>
<td>Tree branches should be trimmed monthly. A 3 foot minimum horizontal clearance from the side of the path (5 foot preferred) and an 8 foot minimum vertical clearance (12 foot preferred) should be maintained. Best practices for trimming established by the International Arborists’ Society should be used. Trees should be inspected on an annual basis for disease or pest infestations; any trees that cannot be reasonably healed, should be removed. Install fencing, apply herbicide, and take other measures to support a healthy and attractive habitat surrounding the trail as needed.</td>
</tr>
</tbody>
</table>
APPENDIX C: REFERENCE DOCUMENTS

The ownership and management as well as the context of each street, road, and highway needs to be considered in the development and design of appropriate facilities. For this reason a flexible approach and reference to the following guides and organizations is recommended.

- Manual of Uniform Traffic Control Devices (MUTCD)
- American Association of State Highway and Transportation Officials (AASHTO)
- National Association of City Transportation Officials (NACTO)
- Institute of Transportation Engineers
- New York State Department of Transportation
NOTES

5. New York State Creating Healthy Schools and Communities. 2016. Creating Healthy Schools and Communities Grant and Program Flyer.
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